REMARKS

Rejections Under 35 USC §103

Claims 1-20 and 42-44 have been rejected under 35 USC §103(a) as being unpatentable over Krall (US Patent No. 4,713,235) in view of either Chorbadjiev et al. (article entitled "The effect of fillers upon properties of electroconductive cyanoacrylate adhesives from the International Journal of Adhesion and Adhesives July 1988), and either Loctite 410 or Loctite 416.

Claims 21, 22, 40 and 41 have been rejected under 35 USC §103(a) as being unpatentable over JP 58196280 in view of the admitted prior art.

The rejections under 35 USC §103 are traversed for the reasons to follow.

Summary of the Invention

Independent claim 1 is directed to a "method for packaging a semiconductor die". The method includes the steps of "providing a leadframe", and "providing a cyanoacrylate adhesive material formulated to cure in less than about 60 seconds in a temperature of about 20°C to 30°C and an ambient atmosphere". The method also includes the steps of "applying the adhesive material in viscous form to the leadframe or the die", "placing the die on the leadframe with the adhesive material in contact with the die and the leadframe", and "polymerizing from 90-100% of the adhesive material in the temperature and the ambient atmosphere in less than about 60 seconds to cure the adhesive layer and bond the die to the leadframe".

Independent claim 6 is similar to claim 1, and states the leadframe comprises "a plurality of lead fingers". This type of leadframe (14A-Figure 5) is sometimes referred to as lead-on-chip leadframe. Claim 6 also recites the

steps of "placing the die on the lead fingers with the adhesive material compressed between the die and the lead fingers", and "wire bonding the die to the lead fingers".

Independent claim 12 is similar to claim 6 and states that the adhesive material includes "a filler configured to reduce cross talk between the lead fingers".

Independent claim 15 recites a formula for the adhesive material, the step of "providing a filler in the adhesive material selected to tailor a characteristic of the adhesive material", and the step of "wire bonding the die to the lead frame".

Independent claim 21 is similar to claim 1, but recites that the adhesive material comprises an "anaerobic acrylic". Independent claim 42 is similar to claim 15, but states that the adhesive material comprises either a "cyanoacrylate adhesive" or an "anaerobic acrylic".

35 USC §103 Rejections of claims 1-20 and 42-44 over Krall in view of Chorbadjiev et al., the admitted prior art and either Loctite 410 or Loctite 416

With respect to the primary reference to Krall, this reference teaches the use of radiopaque cyanoacrylates for medical procedures, rather than a "method for packaging a semiconductor die" as presently claimed. Krall is therefore non analogous art, which would not be known to one skilled in the art at the time of the present invention.

In this regard, two criteria have evolved for determining whether prior art is analogous: (1) whether the art is from the same field of endeavor regardless of the problem addressed, and (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem

with which the inventor is involved. In re Clay, 966 F.2d 656, 658-59, 23 USPQ2d 1058, 1060 (Fed. Cir. 1992).

In the present case neither of these criteria is met by Krall. Specifically, Krall is not in the art of semiconductor packaging, and Krall is not pertinent to the problem of attaching a semiconductor die to a leadframe.

Further, Krall does not teach or enable the concept of a semiconductor packaging method using a cyanoacrylate adhesive. In this regard, the "Background Of The Invention" in Krall states at column 1, lines 47-53: "For instance, in the manufacture of electronic micro-chips it has been suggested that MCA may be a useful adhesive for joining contact leads to the chips. Since a major failure mode of electronic chips occurs at the chip-lead interface, it would be advantageous if such cyanoacrylate adhesives were radiopaque so that the weld could be examined".

This statement in Krall implies the use of cyanoacrylate adhesives has been suggested for joining contact leads to chips, but that cyanoacrylate adhesives may or may not be useful for that application. Without further disclosure one skilled in the art wouldn't know if cyanoacrylate adhesives had been used successfully, or used at all, in the stated application. A reference is only prior art for what it specifically teaches, and there is no teaching in Krall of a semiconductor packaging method using a cyanoacrylate adhesive.

In citing Krall, the Office Action states: "clearly, it was known at the time of the invention was made to utilize a cyanoacrylate adhesive to join the contact leads of a leadframe to a chip." However, this statement is inaccurate as Krall does not mention leadframes. Further, contact leads are not a component of a leadframe, but are

separate wires that are wire bonded to the die and to the leadfingers of the leadframe.

In citing Krall the Office Action further states: "The newly cited reference to Krall suggested the use of cyanoacrylate adhesives to join a chip to leads of a leadframe". Again, this statement is incorrect, as there is no mention of a leadframe in Krall, and no mention of the step of forming a cyanoacrylate adhesive layer between a die and a leadframe, as presently claimed.

Still further, the present claims do not include the step of joining contact leads to a chip using a cyanoacrylate adhesive. Rather, in claims 6-11, 15-20 and 42-44, a "wire bonding" step is used to achieve electrical contact between the leadframe and the die. In claims 12-14, it is stated that the cyanoacrylate adhesive includes an "electrically insulating filler configured to reduce cross talk between the lead fingers", which is in direct opposition to using a cyanoacrylate adhesive to make electrical contact.

Chorbadjiev et al. was cited as teaching that cyanoacrylate adhesives have (1) short setting time at room temperature; (2) one component adhesives; (3) strong bonding action; (4) easy to work with, and; (5) satisfactory electroconductivity of adhesive bonds. In addition, the Office Action states: "The reference . . . additionally provided additional reasoning as to why those skilled in the art at the time the invention was made would have selected cyanoacrylate adhesives for the bonding of the chip to the lead of the leadframe."

However, even though cyanoacrylate adhesives have the above characteristics, there is no suggestion in the cited art of using these adhesives "for the bonding of the chip

to the lead of the leadframe". In this regard, it appears the Examiner has benefited from a reading of the present disclosure, and reverse engineered a reason for the proposed combination of Krall and Chorbadjiev et al. In contrast, under the case law obviousness is to be assessed from the view point of one skilled in the art at the time of the invention, but without the benefit of the invention disclosure. See for example W.L. Gore & Associates v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (1983).

In citing Chorbadjiev et al., the Office Action further states: "It should be noted that the reference to Chorbadjiev et al. is concerned with the manufacture of an electroconductive adhesive material". However, claims 12-14 recite "an electrically insulating filler" which is in direct opposition to "electroconductivity". Chorbadjiev et al. thus "teaches away" from the method of claims 12-14.

The admitted art and the Loctite brochures were cited as teaching cyanoacrylate adhesives which cure or polymerize in less than 60 seconds at room temperature. However, in independent claims 1, 6, 12, 15 and 42 the time and temperature limitations are recited in the context of a "polymerizing" step in a "method for packaging a semiconductor die". In addition, these claims include a recitation in the "polymerizing" step "to cure the adhesive layer and bond the die to the leadframe". The claims thus include limitations which distinguish the method from the inherent characteristics of cyanoacrylate adhesives. In other words, Applicant is not claiming these inherent characteristics, but rather an improved semiconductor packaging method which uses these characteristics.

35 USC §103 Rejections of claims 21, 22, 40 and 41 over JP 58196280 in view of the admitted prior art

JP 58196280 was cited as teaching "it was known to utilize an anaerobic adhesive to join a chip to leads of a board in the manufacture of a semiconductor assembly". The admitted prior art was cited as teaching anaerobic adhesives cure at room temperature in less than sixty seconds.

However, the cited combination does not disclose or suggest using an anaerobic adhesive to bond a die to a leadframe. Rather, in JP 58196280 an electrically conductive paste connects terminal electrodes 4,5 on a chip 1 to conductors patterns 6, 7 on a printed circuit board 2. Further, the cited combination does not disclose or suggest the time and temperature limitations in the context of a "polymerizing" step in a "method for packaging a semiconductor die". In addition, claim 21 includes a recitation in the "polymerizing" step "to cure the adhesive layer and bond the die to the leadframe". Claim 21 thus includes limitations which distinguish the method from the inherent characteristics of anaerobic adhesives.

Further, one skilled in the art at the time of the invention would have no incentive or motivation to combine JP 58196280 and the admitted art. As no such incentive or motivation was identified to support the 35 USC §103, rejections as required by MPEP 2142, 2143, a prima facie case of obviousness has not been stated.

Conclusion

In view of the amendments and arguments, favorable consideration and allowance of claims 1-22, and 40-44 is requested. Should any issues remain, the Examiner is asked to contact the undersigned by telephone.

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